

Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

1. (Currently Amended) An image reading apparatus for processing, for each reading line, image data outputted from an image sensor, said apparatus comprising:

 contour detecting means for detecting, for each object reading line, a pixel with the quantity of change in density higher than a threshold value as a probable edge point thought to be a document edge point, and

 contour correction means for recognizing the document edge point indicating the position of ~~[[the]]~~ a document edge on the basis of the position of said probable edge point.

2. (Currently Amended) The image reading apparatus of claim 1 wherein said contour detecting means is provided with density change calculating means for working out the quantity of change in density on the basis of the image density of ~~[[the]]~~ pixels around an object pixel.

3. (Currently Amended) The image reading apparatus of claim 2 wherein said contour detecting means is provided with judgement means for detecting ~~[[an]]~~ the object pixel as said probable edge point if the values of the respective pixels are identical when the densities of a specific number of consecutive pixels either in the direction of scanning or opposite direction of scanning are binarized on a specific slice level.

4. (Currently Amended) The image reading apparatus of claim 3 wherein when ~~the respective reading lines are~~ each reading line is scanned in a specific direction and the density values of a specific number of consecutive pixels in the opposite direction of scanning from said probable edge point are binarized on a specific slice level, said judgement means recognizes said probable edge point ~~[[of]]~~ to which the values of the respective pixels are identical and ~~judge~~ judges as a first probable edge point the probable edge point first recognized out of ~~[[said]]~~ recognized probable edge points, and

wherein when ~~the respective reading lines are~~ each reading line is scanned in a specific direction and the density values of a specific number of consecutive pixels in the direction of scanning from said probable edge point are binarized on a specific slice level, said judgement means recognizes said probable edge point ~~[[of]]~~ to which the values for the respective pixels are identical and ~~judge~~ judges as a second probable edge point the probable edge point first recognized out of ~~[[said]]~~ recognized probable edge points.

5. (Currently Amended) The image reading apparatus of claim 3 wherein when the densities of a specific number of consecutive pixels either in the scanning direction or the opposite direction of scanning from ~~[[an]]~~ the object pixel are binarized on a specific slice level in an object image of which the density change quantity is regarded by said density change calculating means as less than said threshold value and not lower than ~~[[the]]~~ a second threshold value which is less than said threshold value and in case the values of the respective pixels after binarization are identical, said judgement means detects said pixels as tentative probable edge points.

6. (Currently Amended) The image reading apparatus of claim 5 wherein, when ~~the respective reading lines are~~ each reading line is scanned in a specific direction and the density values of a specific number of consecutive pixels in the opposite direction of scanning from ~~[[said]]~~ each tentative probable edge point are binarized on a specific slice level, said judgement means perceives said tentative probable edge point ~~[[of]]~~ to which the values of the respective pixels after binarization are identical and ~~judge judges~~ as a first tentative probable edge point the tentative probable edge point first recognized out of said recognized tentative probable edge points, and

when ~~the respective reading lines are~~ each reading line is scanned in a specific direction and the density values of a specific number of consecutive pixels in the direction of scanning from ~~[[said]]~~ each tentative probable edge point are binarized on a specific slice level, said judgement means perceives said tentative probable edge point ~~[[of]]~~ to which the values of the respective pixels after binarization are identical and ~~judge judges~~ as a second tentative probable edge point the probable edge point last perceived out of said tentative perceived probable edge points, and at the same time,

when said second tentative probable edge point is not detected on the reading line to which said first tentative probable edge point belongs, said judgement means regards said first tentative probable edge point as a first probable edge point, and

when said first tentative probable edge point is not detected on the reading line to which said second tentative probable edge point belongs, said judgement means regards said second tentative probable edge point as ~~[[said]]~~ a second probable edge point.

7. (Currently Amended) The image reading apparatus of claim 1 wherein said contour correction means determines as permissible scope a scope of a specific distance ~~in the~~ on an object reading line ~~direction from~~ on the basis of a straight line passing through ~~[[said]]~~ two probable edge points detected on separate reading lines between which a specific number of reading lines are intervened ~~apart from each other~~, and recognizes ~~[[said]]~~ a probable edge point on the object reading line ~~points present~~ in said permissible scope as said document edge point points.

8. (Currently Amended) The image reading apparatus of claim 1 wherein said contour correction means determines as permissible scope a scope of a specific distance ~~in the~~ on an object reading line ~~direction from~~ on the basis of a probable edge point detected on ~~[[the]]~~ a reading line separated a specific number of reading lines apart from the object reading line by a specific number of reading lines ~~the object probable edge point~~, and recognizes said probable edge point as said document edge point when said ~~object~~ probable edge point on the object reading line is present in said permissible scope.

9. (Currently Amended) The image reading apparatus of claim 1 wherein said contour correction means works out the gradients of a first permissible scope-setting straight line passing ~~[[the]]~~ through an object probable edge point out of ~~[[the]]~~ permissible scope-setting straight lines passing through two probable edge points separated a specific number of reading lines apart from each other by a specific number of reading lines, a second permissible scope-setting straight line passing through said probable edge point detected on ~~[[the]]~~ a second reading line separated one or a plurality of lines apart from the reading line to which said object probable

edge point belongs, by one or a plurality of reading lines, and a third permissible scope-setting straight line passing through said probable edge point detected on ~~[[the]]~~ a third reading line separated one or a plurality of lines apart from the reading line to which said object probable edge point belongs, by one or a plurality of reading lines.

determines a permissible scope on the basis of a gradient difference value between the second permissible scope-setting straight line and the first permissible scope-setting straight line and a gradient difference value between the third permissible scope-setting straight line and the second permissible scope-setting straight line, and

in case the object probable edge point is present in the permissible scope, recognizes said object probable edge point as said document edge point.

10. (Currently Amended) The image reading apparatus of claim 1 wherein in a reading line where said document edge point is not recognized, said contour correction means recognizes a specific pixel belonging to said reading line as said document edge point on the basis of document edge points recognized on other reading lines.

11. (Currently Amended) The image reading apparatus of claim 10 wherein said contour correction means recognizes as said document edge point ~~[[the]]~~ a pixel located at the intersection point ~~between~~ of a straight line passing through a document edge point recognized on one or a plurality of ~~other~~ reading lines except for an object reading line and ~~[[an]]~~ the object reading line.

12. (Currently Amended) The image reading apparatus of claim 1 wherein said contour correction means acquires positional information on said probable edge point by scanning image data in one or a plurality of directions, said image data outputted from said image sensor, and recognizes said document edge point on the basis of positional information acquired by scanning in one direction or in different directions.

13. (Original) The image reading apparatus of claim 12 wherein when said probable edge point is not detected on a specific number of consecutive reading lines counted from the object reading line in a specific direction where said probable edge point is detected, said contour correction means scans the image data in an opposite direction, said image data outputted from said image sensor.

14. (Currently Amended) The image reading apparatus of claim 13 wherein said contour correction means recognizes as said document edge point ~~[[the]]~~ a pixel located at the intersection point between the object reading line and a straight line passing through one or a plurality of said document edge points recognized by scanning in a specific direction or a straight line passing through one or a plurality of said document edge points recognized by scanning in the other direction.

15. (Original) The image reading apparatus of claim 1 which comprises thinning out means for recognizing a representative value on the basis of positional information on said probable edge point detected on one or a plurality of reading lines and

contour correction means for recognizing the document edge point on the basis of said representative value.

16. (Currently Amended) The image reading apparatus of claim 15 wherein said representative value is a middle point between ~~[[said]]~~ two probable edge points.

17. (Currently Amended) The image reading apparatus of claim 1, further comprising: which is provided with

signal generating means for generating effective width signals indicating ~~[[the]]~~ a document contour on the basis of said document edge point and

image forming means for generating an image within the document contour on the basis of image data outputted from said image sensor and said effective width signals.

18. (Currently Amended) The image reading apparatus of claim 1, further comprising ~~which is provided with~~ output substitution means for detecting the outside of ~~[[the]]~~ a document contour of the image data outputted from said image sensor on the basis of said document edge point, substituting the image data outside said document contour with a white image and outputting the data.

19. (Currently Amended) The image reading apparatus of claim 1, further comprising ~~which is provided with~~ image data substituting means for detecting the outside of ~~[[the]]~~ a document contour of the image data on the basis of said document edge point, said image data

stored in an image memory for storing said image data outputted from said image sensor, and substituting the image data outside said document contour with a white image.

20. (Currently Amended) The image reading apparatus of claim 1, further comprising ~~which is provided with~~ document image reading means for detecting ~~[[the]]~~ a document contour of the image data on the basis of said document edge points, said image data stored in ~~[[said]]~~ an image memory, and outputting the image data within said detected document image contour only.

21. (Currently Amended) The image reading apparatus of claim 1, further comprising ~~which is provided with~~ closing and opening detection means for detecting a document cover to prevent light from reaching said image sensor from outside and the opening and closing of said document cover and, in case the document cover is opened, actuates said contour detecting means.

22. (Currently Amended) A processing apparatus for processing image data, comprising ~~which comprises~~:

contour detecting means for detecting a pixel as a probable edge point thought to be a document edge point, said pixel having a higher quantify of change in density than ~~[[the]]~~ a threshold value, and

contour correction means for recognizing a document edge point indicating the position of ~~[[the]]~~ a document edge on the basis of the position of said probable edge point.

23. (New) An image reading apparatus for processing image data outputted from an image sensor, said apparatus comprising:

contour detecting means for detecting a pixel with the quantity of change in density higher than a threshold value as a probable edge point thought to be a document edge point, and

contour correction means for recognizing the document edge point indicating the position of a document edge on the basis of the position of said probable edge point, wherein

said contour detecting means is provided with judgement means for detecting an object pixel as said probable edge point if the values of the respective pixels are identical when the densities of a specific number of consecutive pixels either in the direction of scanning or opposite direction of scanning are binarized on a specific slice level,

when each reading line is scanned in a specific direction and the density values of a specific number of consecutive pixels in the opposite direction of scanning from said probable edge point are binarized on a specific slice level, said judgement means recognizes said probable edge point to which the values of the respective pixels are identical and judges as a first probable edge point the probable edge point first recognized out of recognized probable edge points, and

wherein when each reading line is scanned in a specific direction and the density values of a specific number of consecutive pixels in the direction of scanning from said probable edge point are binarized on a specific slice level, said judgement means recognizes said probable edge point to which the values for the respective pixels are identical and judges as a second probable edge point the probable edge point first recognized out of recognized probable edge points.

24. (New) An image reading apparatus for processing image data outputted from an image sensor, said apparatus comprising:

contour detecting means for detecting a pixel with the quantity of change in density higher than a threshold value as a probable edge point thought to be a document edge point, and

contour correction means for recognizing the document edge point indicating the position of a document edge on the basis of the position of said probable edge point, wherein

said contour detecting means is provided with judgement means for detecting an object pixel as said probable edge point if the values of the respective pixels are identical when the densities of a specific number of consecutive pixels either in the direction of scanning or opposite direction of scanning are binarized on a specific slice level, and

when the densities of a specific number of consecutive pixels either in the scanning direction or the opposite direction of scanning from the object pixel are binarized on a specific slice level in an object image of which the density change quantity is regarded by said density change calculating means as less than said threshold value and not lower than a second threshold value which is less than said threshold value and in case the values of the respective pixels after binarization are identical, said judgement means detects said pixels as tentative probable edge points.